

NEW TECHNOLOGY SAVES ENERGY IN COMPUTER INTENSIVE FACILITIES

Computers have changed the way we do business, the way we purchase things and the way we communicate. Computers are the most important invention since the television in the daily lives of Americans. Nearly every desk in corporate America has a computer on it.

The use of computers causes power quality problems in data processing centers and other facilities having an electricity load driven by computers and computer-controlled devices. Unlike motors and pumps, computers generate a pulsating demand for power which causes undesirable electric system harmonics. These harmonics increase energy demand, reduce electronic equipment life, and – by causing additional heating in the electrical system — increase a facility's air conditioning load. In turn, the increased electric load requires bigger transformers to meet the demand.

The concept of harmonics can be difficult for a layperson to understand. Imagine that you are in your living room watching television. Your neighbor starts mowing his yard. The outside noise comes into your home and is so distracting that you no longer can clearly understand what is being said on your television. To compensate for the noise, you must turn up the volume to continue watching the television. Similarly, computer systems demand more power to compensate for the electronic effects of harmonics. Eliminating harmonics allows



the computer system to operate properly with less energy.

Opportunities for eliminating harmonics abound

Through the California Energy Commission's Public Interest Energy Research (PIER) Program, the state is testing a new power quality technology designed to eliminate system harmonics. Conducted at the California Franchise Tax Board (FTB) facilities in Sacramento, the project validated the technology's performance and energy savings.

The technology demonstration encompassed several objectives, including estimating the energy efficiency improvements and energy savings provided by the new harmonics mitigation technology. Field data was collected to determine the amount of harmonic currents before and after the installation of the technology. A case study determined the actual economic benefits and payback of applying the harmonics current-reducing technology to a data processing operation, which in this case was the FTB.

Franchise Tax Board Evaluation A Success

Under contract to the California Energy Commission, the Electric Power Research Institute (EPRI) technical staff conducted

laboratory tests and field measurements of an emerging power quality technology that claims both to mitigate system harmonics and to provide substantial energy savings. This technology is specifically tuned for computer-driven loads and the high third harmonics these systems produce.

The primary field evaluation location was the California Franchise Tax Board's Sacramento facility known as Building 1. Approximately 450,000 square feet in size, Building 1 contains a data center and a large computer processing area with over 2,500 computer workstations. The site is highly representative of California's industrial data centers and computer processing centers.



An initial laboratory analysis of the technology determined the performance envelope of the system based on a range of electrical network loads. EPRI technical personnel then temporarily installed the harmonics mitigation technology in Building 1 and completed a field evaluation of the technology in the FTB facility. The laboratory data and the field data were then analyzed by EPRI staff and compared with the vendor's performance claims.

A New Energy-Saving Technology Emerges

PIER-funded research has validated the vendor's claims of 4 – 6 percent energy savings for this new technology which successfully mitigates electric system harmonics.

This new tool will assist California industrial and commercial end users in evaluating the estimated improvements in energy efficiency received from installing this technology in their operations. The results of this independent analysis have been shared with industry associations and agencies so that other potential applications can be evaluated using the information and tools developed through PIER. As a result,

- The California Franchise Tax Board is interested in purchasing and installing this technology in both existing buildings and a proposed new building.
- The U.S. Army Corps of Engineers intends to incorporate the research results as an option in their future electrical construction specification updates. By applying emerging technologies such as these to new con-



struction, additional cost savings can be realized from reducing the system electrical over sizing normally applied to electrical distribution systems when high levels of harmonics are expected.

- The California Lottery Commission intends to upgrade its transformers to include this new technology. Based on

PIER's support, the Lottery Commission was able to quickly identify a solution to their harmonics problem and select a solution that also provides increased energy efficiency.

Utilities are evaluating this technology for future energy efficiency rebates and energy reduction initiatives.

For More Information Contact:

Pramod Kulkarni
California Energy Commission
1516 9th Street, MS-43
Sacramento, CA 95814
(916) 654-4637
pkulkarn@energy.state.ca.us
www.energy.ca.gov/pier

and

Brian Fortenbery
EPRI PEAC Corporation
942 Corridor Park Blvd
Knoxville Tennessee, 37932
(865) 218-8012
BFortenbery@epri-peac.com